

DETAILED ACTION

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Nathan Davis on 18DEC2008.

The application has been amended as follows:

In the Claims

24. (Currently amended) A computer device containing hardware for implementing an [[An]] asynchronous completion notification system for use in an RDMA (remote data memory access) network interface card (RNIC) having a completion queue (CQ) for holding completion queue entries (CQEs), comprising:

~~a computer device;~~

a system for storing a first CQE number of the most recent CQE placed into the CQ, wherein the first CQE number is stored in a CQ context;

a system for storing a second CQE number of the most recent CQE retrieved from the CQ, wherein the system for storing the second CQE number is implemented by a verb layer;

a system for packaging the second CQE number with each request completion notification verb that is issued;

a processing system for processing the request completion notification verb, wherein the processing system compares the first CQE number with the second CQE number to determine whether asynchronous completion notification should be immediately performed, and wherein the processing system causes asynchronous completion notification to be immediately performed if the second CQE number is less than the first CQE number or waits until a next CQE is placed into the CQ if the second CQE number is equal to the first CQE number; and

a system for storing a third CQE number for the most recent solicited CQE placed into the CQ, wherein the request completion notification verb is further packaged with a type of completion notification; wherein the processing system includes a system for checking the type of completion notification; and wherein, if the type of completion notification is solicited, the processing compares the third CQE number with the second CQE number to determine whether asynchronous completion notification should be immediately performed.

30. (Currently Amended) A computer device containing hardware for implementing a [[A]] system for implementing asynchronous completion notification in an RDMA (remote data memory access) network interface card (RNIC) having a completion queue (CQ) for holding completion queue entries (CQEs), comprising:

~~a computer device;~~

means for storing a first CQE number of a most recent CQE placed into the CQ;

means for storing a second CQE number of a most recent CQE retrieved from the CQ;

means for issuing a request for completion notification;

means for packaging the second CQE number with the request;

means for processing the request, wherein the processing means compares the first CQE number with the second CQE number to determine whether asynchronous completion notification should be immediately performed, wherein the processing means immediately performs asynchronous completion notification if the second CQE number is less than the first CQE number or waits until a next CQE is placed into the CQ before performing asynchronous completion notification if the second CQE number is equal to the first CQE number.

means for storing a third CQE number for the most recent solicited CQE placed into the CQ;

means for packaging a type of completion notification with the request;

means for checking the type of completion notification; and

means for comparing the third CQE number with the second CQE number if the type of completion notification is solicited, to determine whether asynchronous completion notification should be immediately performed.

Allowable Subject Matter

2. The following is an examiner's statement of reasons for allowance:

Regarding **claims 24, 27, and 30**, the best prior art found during the examination of the present application, **Jay et al (US Patent # US 6,901,463 B2)**, teaches a method is provided for linking entries in a completion queue, which comprises operation completion notifications, with the work requests that initiated these network operations. These work requests are added to work queues by client processes to request a network operation. For each work queue, a tracking list is created. Each work queue and tracking list is associated with one completion queue. When a work request is posted to a given work queue, an entry is added to the associated tracking list. The entry in

the tracking list contains all of the information needed to uniquely link a completion queue entry to a work request, providing the information needed for a client process to perform post-execution processing for the work request, i.e., a work request identifier and a resource identifier (abstract, column 2 lines 26-40).

Haydt (US Patent Publication # US 2004/0019882 A1), teaches methods, systems, and computer program products for processing one or more data communication operations such that the per-operation processing overhead decreases as the number of operations to process increases. One or more operations are inserted into one or more work queues for processing by a hardware adapter. A queue-specific identifier may be written to a work queue doorbell to notify the adaptor that an unprocessed entry has been inserted into the work queue. As processing completes for an operation, a completion queue entry is generated and inserted into a completion queue. Each completion queue holds completion queue entries for one or more work queues (abstract, paragraph [0010], [0011], [0012]).

Coffman et al. (US Patent # US 6,718,370 B1), teaches a host system is provided one or more hardware adapters; multiple work queues each configured to send and receive message data via said one or more hardware adapters; multiple completion queues each configured to coalesce completions from multiple work queues belonging to a single hardware adapters; and a completion queue management mechanism configured to check for completions across multiple completion queues in the context of either a single thread or multiple threads of operation (abstract, column 12 lines 37-67, column 13 lines 1-9).

However, Jay et al., Haydt, and Coffman et al. fail to teach, either alone or in combination, *“...storing a first CQE number of a most recent CQE placed into the CQ in a CQ context; storing a second CQE number of a most recent CQE retrieved from the CQ; issuing a request for completion notification; packaging the*

second CQE number with the request; processing the request, wherein the processing step compares the first CQE number with the second CQE number to determine whether asynchronous completion notification should be immediately performed, wherein the processing immediately performs asynchronous completion notification if the second CQE number is less than the first CQE number or waits until a next CQE is placed into the CQ before performing asynchronous completion notification if the second CQE number is equal to the first CQE number; storing a third CQE number for the most recent solicited CQE placed into the CQ; packaging a type of completion notification with the request; checking the type of completion notification during the processing step; and if the type of completion notification is solicited, comparing the third CQE number with the second CQE number to determine whether asynchronous completion notification should be immediately performed.”

Claims 25-26, 28-29, and 31-32 are allowed by virtue of their dependency on **claims 24, 27, and 30**, respectively.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- US 2008/0256280 A1
- US 7,457,861 B1
- US 2005/0149623 A1

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MURRAY whose telephone number is 571-270-1773. The examiner can normally be reached on Monday - Friday 0800-1700 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tonia Dollinger can be reached on (571)-272-4170. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DCM/
Examiner, Art Unit 2443

/Tonia LM Dollinger/
Supervisory Patent Examiner, Art Unit 2443